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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/090,316

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Peter G. Borden

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EXAMINER

ROSENBERGER, RICHARD A

ART UNIT

PAPER NUMBER

2877

DATE MAILED: 06/10/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/090,316

Applicant(s)

BORDEN ET AL

Examiner

Richard A Rosenberg

Art Unit

2877

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 4/22/2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☐ Claim(s) 1-12, 15-19 and 21-36 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☐ Claim(s) 1-12, 15-19, 21-36 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>4/22/04</u> . | 6) <input type="checkbox"/> Other: _____  |

1. Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1, lines 4 and 5, has been amended to read in part "heating a region of the first layer power modulated at a frequency" which is ungrammatical; something appears to be missing, probably between "layer" and "power". It has been assumed the claim was intended to read "heating a region of the first layer *using* power modulated at a frequency" or similar language, and is so treated below.

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-7, 9-19 and 21-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rosencwaig et al (US 4,636,008) in view of Maris (US 5,706,094).

The Rosencwaig reference discloses heating a region of a sample to evaluate surface layers (column 6, line 57-63) using power modulated at a frequency, note column 6, lines 14 through 17 that discloses "the sample is subjected to periodic localized heating" by a "laser 30 which is modulated by modulator 32".

Claim 1 limits the modulation frequency to “to be sufficiently low to ensure that temperature of said region varies substantially linearly relative to said modulated power”, but does not set forth what that frequency may be in terms of Hz. Claim 2, dependent from claim 1, limits the frequency to be “smaller than a maximum frequency beyond which nonlinearities in temperature response of said region become measurable”, but again, does not state what the frequency may be in terms of Hz. Claim 3, dependent from claim 2, however, does present the maximum frequency in terms of Hz, stating that the maximum frequency to “is approximately 100 kHz.” The Rosencwaig reference discloses that the frequency to be used “is preferably greater than 50kHz” (column 6, lines 18-19). Thus Rosencwaig teaches using frequencies in the range of 50-100kHz, which fall within the instant claimed range of less than 100 kHz of claim 3; as claim 3 is dependent from claim 2 and, through claim 2 is dependent from claim 1, Rosencwaig also teaches using frequencies that inherently meet the criteria of those claims.

Claim 5, dependent from claim 2, limits the claim to being less than the value given by a particular formula, but also does not give the claimed frequency in term of Hz. However, the instant specification notes, in a discussion of the formula (see page 12, lines 3-28) that the maximum limit of the predetermined frequency is 100 kHz (page 12, lines 27-28), the same limit that is claimed in instant claim 3, and within the range taught by Rosencwaig. Claim 12 sets forth the frequency as “sufficiently low to ensure that an instantaneous temperature in said region is

approximately equal to another temperature obtained in said region by heating with an unmodulated beam having a power equal to an instantaneous value of said first power”, and claim 19 claims this frequency as being “sufficiently low to ensure transfer of a majority of heat from a region ... illuminated by said first beam by diffusion”, but does not give the frequency in term of Hz. For reasons such as set forth above, reading the claims in light of the specification, these limitations appears to be other ways of claiming less than a maximum frequency of 100kHz, which is taught by Rosencwaig.

Instant claims 11 and 19 include limitations on the power of the probe (second) beam. The purpose of the pump beam of Rosencwaig is to heat the sample, while the purpose of the probe beam is to measure the response of the reflectivity of the sample resulting from that heating. Thus it would have been obvious to keep the power of the probe beam low enough to avoid significant heating of the sample since any heating of the sample by the probe beam would interfere with the accuracy of the measurement intended to be made.

Rosencwaig directs his invention to measuring dopant concentrations in semiconductors prior to annealing. That reference in no way teaches or suggests that the measuring method disclosed therein will not work with annealed wafers; disclosing that the method works with one type of sample does not disclose that it does not work with other types of samples. Maris shows a similar system, which like Rosencwaig directs a pump beam at a semiconductor sample and uses a probe

beam to measure the change in the reflectivity of the sample due to the interaction of the sample and the pump beam, explicitly teaches that the method is usable with both unannealed and annealed samples; see figures 10A and 10D in particular. As Maris teaches that similar test based upon the same general principle of measuring the change of reflectivity based upon the interaction of a modulated pump beam with both annealed and unannealed samples, it would have been obvious to measure both annealed and unannealed samples with the device of Rosencwaig et al. Both references disclose that the techniques being used therein can be used to measure the dopant concentration in the sample, and thus measure an electrical characteristic.

As in instant claim 6, the Rosencwaig reference compares (claim 7 of the reference) the beam to a known standard, which comparison includes determining if the reflected power is greater than some predetermined power from the standard. The use of a lock in amplifier, as in instant claim 7, is known, see lock-in amp 36 of Maris. Rosencwaig et al teaches moving the test area of the sample to test a different region of the sample (column 6, lines 8-12) as in instant claim 9.

The use of a measuring system to adjust a process tool, as in instant claims 4, 10, and 19, is known in the art. It would have been obvious to use the results of a measurement as disclosed by Rosencwaig to adjust a process tool. Rosencwaig specifically places the measurement in a manufacturing environment to evaluate the manufacturing process (column 3, lines 12 : “[s]uch evaluation at this early

stage is highly desirable since it can give information about success or failure of the implantation step"); it would have been obvious to use such information about the failure of the implantation step to adjust the process.

Certain of the claims, claims 15-18 and 21-36, state that particular materials or classes of material are being measured. The references relate the measurements to the type of materials used in semiconductor manufacture. The claimed materials are the type of materials found in semiconductor manufacture, and thus those in the art would reasonably anticipated that the measurements would be useful for these materials as well as the specific materials mentioned by the references, and that any experimentation that would have been necessary to verify the usefulness would have been simple, straightforward, and in no way "undue". Patent law does not require absolute certainty, but only a reasonable expectation that does not require undue experimentation. Clearly the reasonable expectation and lack of need of undue experimentation is present for the materials being claimed.

4. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Rosencwaig et al (US 4,636,008) in view of Maris (US 5,706,094) as applied to claim 2 above, and further in view of Rosencwaig et al (US 4,750,822).

Rosencwaig et al ('088) does not specifically mention the use of the filter of instant claim 8. It is known in the art that such a filter can be used and is useful; see filter 60 of Rosencwaig et al ('822), "which is designed to remove any traces of


the modulated pump beam" (column 8, lines 13). It would have been obvious to use such a filter in the system of Rosencwaig et al ('088) as taught by Rosencwaig ('822).

5. Papers related to this application may be submitted to Group 2800 by facsimile transmission. The faxing of such papers must conform to the notice published in the Official Gazette, 1096 OG 30 (15 November 1989). The fax number is (703) 872-9306

Any inquiry concerning this communication or earlier communications from the examiner should be directed to R. A. Rosenberger whose telephone number is (571) 272-2428.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0956.

R. A. Rosenberger  
3 June 2004



Richard A. Rosenberger  
Primary Examiner